

# Exhibit 47



[Back](#)

**TIRE BASICS**

# How Are Tires Made?

The average person sees a tire for their daily vehicle as a plain, round, and black object that is most definitely an unavoidable requirement. Tires for everyday use, be it passenger, SUV, or light truck tires, are simply misunderstood by many consumers.



Sure, the tires are round and black, but that's just the beginning. Tires are complex. They're in charge of helping to smooth out road textures and irregularities, and to handle both traction and braking when needed to start, drive, and stop vehicles.

And it all starts with how tires are built.

## Who Invented Tires

Interestingly, tires predated Charles Goodyear's 1839 invention of vulcanized rubber, which turned natural rubber into a more useful material for our application. Indeed, tires for wagons were once leather or iron hoops fitted to wooden wheels. It took a pair of Scottish inventors (Robert William Thompson in 1847 and John Boyd Dunlop in 1888) working separately – and forty years apart – to take the vulcanized rubber and make a pneumatic (air-filled) tire for bicycles. Finally, in 1895, [the first vulcanized rubber car tire](#) was made.

This website uses cookies and tracking technologies to improve user experience, analyze performance, and share data with social media, advertising, and analytics partners. For more details, please refer to our [Privacy Policy](#)

[Manage Preferences](#)

OK

Chat



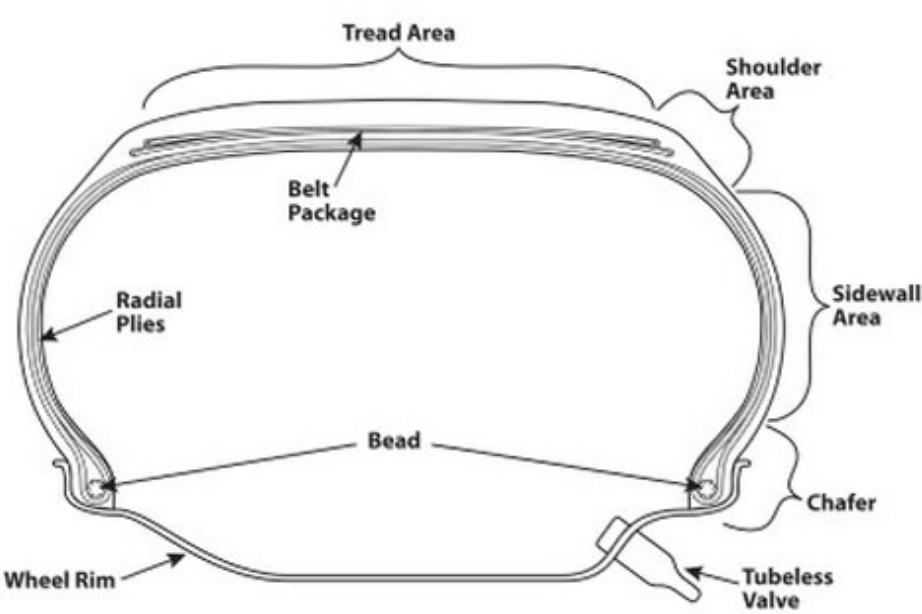
# The Process of Manufacturing a Tire

Tires are designed to handle a wide range of driving conditions. Engineers create designs for off road, high performance, heavy load carrying and all-season driving conditions, to name a few. As a result of the variety of tire types, the manufacturing process must be able to produce a wide variety of rubber compounds and components that when combined into a tire will perform to help meet the customer’s requirements. The manufacturing process consists of the following primary steps:

- 1. Mixing.** Natural and synthetic rubbers are mixed with many other chemicals to create a compound that serves a particular purpose within the tire. There are many versions of rubber compounds based on location in the tire and the tire performance desired. All the ingredients are mixed in specific amounts per a specification for use it the next steps.
- 2. Extrusion.** Some of the rubber that leaves mixing goes to the extruders. Here rubber is pushed through a die to create shapes made of one or more different compounds in different locations to be used in the tire. Examples would be the tread and sidewall extrusions.
- 3. Calendering.** In this process rubber is either calendered, or pressed, into a rubber sheet or impregnated into fabric or steel to create a rubber coated reinforced sheet to be cut into components for the tire. Examples of these components include the inner liner, body plies, and belts. There are many versions of fabric and steel as well as compounds used based on the type and service of the tire.
- 4. Tire Building.** The tire itself is a very complex composite of materials. Tire building takes all the components listed on the specification which were produced in the previous steps and puts them together to create the uncured (green) tire. The tire is assembled from the inside out by wrapping the components around a drum and forcing them together using internal air pressure and rollers pressing from the outside to consolidate the components together.
- 5. Curing.** The curing process is where the tire becomes the tire as consumers know it. Here the uncured or green tire is placed into a mold which is mounted into a press. Once the tire is loaded into the press a bladder inflates into the tire at low pressure to hold the tire in place as the mold closes around the tire. Once closed, high pressure steam or gas fills the bladder forcing the tire into the mold to take the final shape of the tire. The proper time, temperature and pressures are listed on the specification for curing the tire and are determined by running thermocouple tests to set the optimal cure setup.
- 6. Measuring and Testing.** Once the tire is cured it is not quite ready to send to a waiting customer. First it goes to a machine where it is inflated and ran against a wheel at a certain load and inflation pressure. This measures variation in forces that would be exerted against the road. Next the tire is balanced using a balance machine.

This is a somewhat simple explanation of the manufacturing process for a tire and there are MANY details that are not covered here but when these steps are followed as specified, they translate to a completed tire.

## The Different Parts of a Tire



A tire is made up of many different components, all working together to help ensure you have a safe, smooth drive down the road. Listed below are the major components of the majority of tires.

This website uses cookies and tracking technologies to improve user experience, analyze performance, and share data with social media, advertising, and analytics partners. For more details, please refer to our [Privacy Policy](#)

- **Chafer.** The chafer is an extruded component that wraps around the bead area of the tire. It interfaces with the wheel to form a seal between the tire and wheel. The chafer is made from an abrasion resistant rubber that helps it hold up to the wear the wheel exerts on the tire.
- **Ply.** The ply is a calendared sheet of rubber coated fabric. All the other components in the tire are either directly or indirectly connected to the ply. The ply wraps around the bead on both sides of the tire and gives the tire its strength and the ability to flex without losing its shape.
- **Sidewall.** The sidewall is an extruded component that is the most visual part of the tire. The sidewall protects the ply from the environment, is abrasion resistant, and provides a substrate for the lettering and decorations to be molded into the tire. Sidewalls can have multiple compounds included in different zones such as a zone of white rubber for white sidewall tires.
- **Belts and Overlay.** The belts are a calendared sheet of rubber coated steel wire. The overlay is a calendared sheet of rubber coated fabric. The belts help provide rigidity, strength, and puncture resistance to the crown area of the tire. Many tires include overlay which is wrapped around the tire and covers the belts. The overlay helps improve the speed capabilities of high-performance tires.
- **Tread.** The tread is an extruded component. It can be made from a wide range of compounds based on the application of the tire. It provides a substrate for the tread pattern to be molded into the tire. The tread contacts the road and gives the tire grip to accelerate, stop, and corner. The tread also provides cushioning for a smooth ride.

## Tires Meant for Certain Vehicles

Different types of vehicles often require different types of tires. For example, [all-season tires](#) meant for passenger and commuting vehicles may be designed more for comfort and energy efficiency – in this case they might be constructed for enhanced low rolling resistance performance, for increased fuel economy or with a sidewall construction that would help provide a quiet, comfortable ride.

Conversely, [tires for high-performance vehicles](#) may be manufactured with softer rubber compounds to give better traction for cornering. [All-terrain tires](#) designed for on/off-road use, on the other hand, have deeper, chunkier treads for enhanced traction in mud.

## Find All of These Different Tires at Your Local Goodyear Store

Goodyear has a wide variety of tires built in different ways to fit your car and your driving style. Be sure to stop into your [local Goodyear retailer](#) to discuss your tire needs with your friendly service provider.

## Related Articles

[See All Articles](#) ➔

### CHOOSING YOUR TIRES

#### [How to Buy Tires Online](#)

[Read Article](#) ➔

### TIRE BASICS

#### [How Long Do Tires Last?](#)

[Read Article](#) ➔

### TIRE BASICS

#### [Why Are Tires Black?](#)

» « . . . »

This website uses cookies and tracking technologies to improve user experience, analyze performance, and share data with social media, advertising, and analytics partners. For more details, please refer to our [Privacy Policy](#)

LET'S CONTINUE

Find tires for  
your vehicle

This website uses cookies and tracking technologies to improve user experience, analyze performance, and share data with social media, advertising, and analytics partners. For more details, please refer to our [Privacy Policy](#).